MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

BMM 1014 – MATHEMATICS FOR MANAGERS

(All Sections / Groups)

17 OCTOBER 2016
9.00 a.m. to 11.00 am
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 pages with 5 questions only.
2. Attempt any **FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Formulae are attached at the end of the question paper.

QUESTION 1

(a) Mr. Bean owns a small publishing company specialised in story books for kids. At a volume of 800 books, the publication cost is RM33,000, while at a volume of 500 books, the publication cost is RM24,000. Assume that publication cost and volume of books are linearly related.

(i) Find and equation that relate the publication cost $[C(x)]$ to the volume of books. (5 marks)

(ii) How much would be the publication cost if one book is added to the book's publication? (2 marks)

(iii) Find the selling price of the book if the company wish to earn a profit of RM21,000 at the volume of 600 books. (4 marks)

(iv) Find the break-even volume of the books of the company. (3 marks)

(b) ABC is a local company that produces home theatre. There are three different models of home theatre sets: deluxe, super-deluxe, and ultra. Each of these products has to go through three stages of production which involved electronics, assembly and finishing. Each deluxe set requires 2 hours of electronics work, 3 hours of assembly time, and 5 hours of finishing time. Each super-deluxe requires 1, 3 and 2 hours of electronic, assembly, and finishing time, respectively. Each ultra requires 2, 2, and 6 hours of the electronic, assembly, and finishing time, respectively. There are 54 hours available for electronics, 72 hours available for assembly and 148 hours available for finishing per week. How many of each model should be produced each week if all available times are to be used?

(11 marks)

(Total: 25 marks)

Continued...

QUESTION 2

I- Home Corporation manufactures two products, benches and tables. The company has two main resources, carpenters and a supply of redwood for use in furniture. In a month, there are 1200 hours of labour and 8,000 feet of redwood available. Each bench requires 2 labour hours and 10 feet of redwood while each table requires 3 labour hours and 25 feet of redwood. Completed benches will yield a profit of RM15 each and tables will result in a profit of RM18 each. One of its customers has ordered 50 benches and 100 tables. The company's aim is to obtain maximum profit while meeting customer's order.

(a) Formulate the above problem into a Linear Programming problem.

(5 marks)

(b) Graph and show the feasible region of the above problem clearly.

(7 marks)

(c) Advise I-Home on the optimal solution and the associated maximum profit by using the method of corner.

(10 marks)

(d) What would be the effect on the optimal solution if the profit gained per bench has been increased to RM18 and profit gained per table has been reduced to RM16?

(3 marks)

(Total: 25 marks)

Continued...

QUESTION 3

(a) How many months will it take for an amount of RM 300,300 to yield RM 1,800 as interest at 6.5% per annum of simple interest?

(4 marks)

(b) What is the difference between the compound interests on RM 9,999 for $1\frac{1}{2}$ years at 4.44% compounded yearly and half-yearly?

(8 marks)

(c) If RM9,500 is deposited in a saving account that earns interest at an annual rate of 5.75% compounded continuously. what is the value of the account at the end of ten years?

(4 marks)

(d) In April 2016, the average rate for a 30-year fixed mortgage was 3.43%. Assume a down payment of 20% on a home purchase of RM272,900.

(i) What will be the monthly payment?

(5 marks)

(ii) What will be the outstanding principal after 10 years?

(4 marks)

(Total: 25 marks)

Continued...

QUESTION 4

a) Find the derivative of each function:

(i) $y = \ln\left(\frac{2-x^2}{1+x}\right)$ (5 marks)

(ii) $y = \left(\sqrt{3x^2+4}\right)\left(e^{3x^2}+9\right)$ (5 marks)

b) Find the marginal revenue function in terms of Q if the demand equation is expressed as

$$Q = \frac{350 - p^3}{2}$$

(6 marks)

c) The total production cost of food production company can be expressed as

$$C(x) = 7x^3 - 5300x^2 - 800000x + 975050000$$

Find the quantity level that needs to be produced by the company in order to achieve the minimum cost. (9 marks)

(Total: 25 marks)

Continued...

QUESTION 5

(a) Find the definite integral $\int_1^6 \frac{9x^3 - 4x^2 + 6}{x^2}\,dx$ (5 marks)

(b) Lorimar Watch Company manufactures travel clocks. The daily marginal cost function associated with producing these clocks is

$$C'(x) = 0.000009x^2 - 0.009x + 8$$

where $C'(x)$ is measured in dollars/unit and x denotes the number of units produced. Management has determined that the daily fixed cost incurred in producing these clocks is \$140. Find the total cost incurred by Lorimar in producing the first 300 travel clocks/day.

(5 marks)

(c) The total daily revenue (in dollars) that Weston Publishing realizes in publishing and selling its English-language dictionaries is given by

$$R(x, y) = -0.006x^2 - 0.003y^2 - 0.001xy + 20x + 15y$$

where x denotes the number of deluxe copies and y denotes the number of standard copies published and sold daily. The total daily cost (in dollars) of publishing these dictionaries is given by

$$C(x, y) = 6x + 2y + 200$$

Determine how many deluxe copies and how many standard copies Weston should publish each day in order to maximize its profits. Please round off the answers to the nearest integer. What is the maximum profit realizable?

(15 marks)

(Total: 25 marks)

Continued...

LIST OF FORMULAE

1. Quadratic Formula

The solution of the equation:
$ax^2 + bx + c = 0$,
$a \neq 0$, are $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. Simple Interest

Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

Accumulated amount, $A = P(1 + i)^n$, where $i = r/m$, and $n = mt$ (m = number of conversion periods per year)

4. Continuous Compound Interest

$A = Pe^{rt}$

5. Effective Rate of Interest

$r_{eff} = (1 + r/m)^m - 1$

6. Present Value for Compound Interest

$P = A(1 + i)^{-n}$

7. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R dollars periodic payment)

8. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R dollars periodic payment)

Continued...

9. Amortization Formula

$$R = \left[\frac{Pi}{1-(1+i)^{-n}} \right]$$

(R = periodic payment on a loan of P dollars to be amortized over n periods)

10. Sinking Fund Formula

$$R = \left[\frac{Si}{(1+i)^{n}-1} \right]$$

(R = periodic payment required to accumulate S dollars over n periods)

11. Break-even point = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$ (Contribution per unit = unit selling price – unit variable cost)

Sales (unit) = $\frac{\text{Fixed cost + Target profit}}{\text{Contribution per unit}}$

Calculus

12. Product rule

$$f(x) = u(x).v(x)$$

$$f'(x) = u(x).\frac{dv}{dx} + v(x).\frac{du}{dx}$$

13. Quotient rule

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$

End of Paper